

Simple Road Cleaning System

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Abstract - Cleaning is one of the most important necessities for everyone and should be part of everyday life. The machine can be used for various cleaning applications such as cleaning roads, floors, bus stands, etc. Our projects aim to use low-cost, easy-to-manufacture, and easy-to-use processable materials. It is an alternative to conventional methods of cleaning roads which cause an increase in dust particles in the air which can be bad for respiratory systems, which can be prevented with the use of this machine.

Key Words: Road Cleaning, Dust Collection, Pollution Control, Environment Cleanliness.

1. INTRODUCTION

Urban lifestyle has brought increase in garbage problem in city roads. Land pollution due to household refuses and plastic wastes are increasing and creating unhygienic environment. This results in contaminating water bodies like rivers and ponds and developing a preferable environment for mosquitoes, flies and other insects which are carriers of diseases like dengue, malaria, cholera, etc. Hence, it is important to control land pollution and deal with road garbage. The following paper proposes a solution to support this cause. The Road Cleaning Machine due to its compact size allows it to be used in narrow and cramped spaces. This machine comprises simple mechanical parts and is controlled by Node MCU based basic circuit, having a light weight and cost-efficient design.

2. Literature Review

M Ranjit Kumar and N Kapilan [1] created Floor cleaning robots are active in various places. These devices require a power source to work and don't seem user friendly. India is experiencing a major power crisis, especially in the summer, and most floor cleaning machines are not being used effectively. A floor cleaning machine was modeled and analyzed using various components within the following projects. Prathmesh Joshi's [2] report relies on the "Manual platform cleaning machine" that meets the essential needs of cleaning large floors. Heqing Xu [3] talks about different sorts of road cleaning vehicles that are developed to date and also the technological development done in this era. It also sheds light on the challenges while making any road cleaning mechanism. It also consists of the development history of the road cleaning vehicles and information about the present representative products on market. Kaushal Kapadne [4] talks about a road cleaning machine that uses two scrubbers and one broom to center the dust and garbage and a vacuum

to collect it in a container in the machine. The container can be cleaned by sliding it out of the machine from the back. They also consist of DC motors for the scrubbers and the brooms rotation is done with the help of gears connecting the axel and the broom shaft. Not just the vehicles, but the paper also consists of information on the technological development that has occurred in so many years.

3. Methodology

In the literature review, we referred to four research papers, where we found out that there aren't a lot of machines for small cleaning alleyways and small roads. The machine was designed in solid works and the materials were selected after the designing was done. The road cleaning machine is being made for workers to be able to clean the road easily and effortlessly. The machine is supposed to be used on smaller roads and alleys. It uses two scrubbers and one broom in total to clean the dust and garbage and, stores it in a container at the back of the machine, which can be emptied later.

3.1 Design

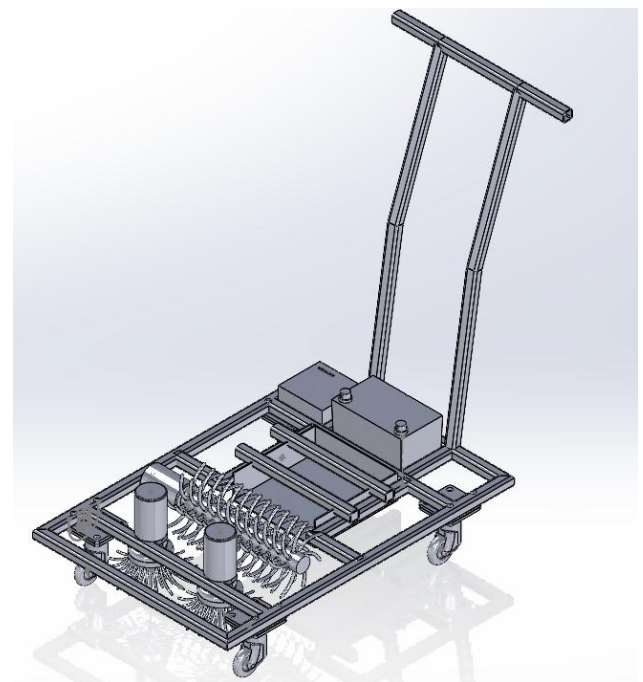


Fig 1. Final Assembly

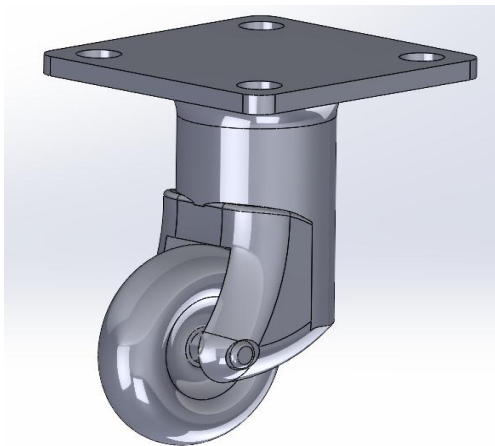


Fig 2. Wheel Model

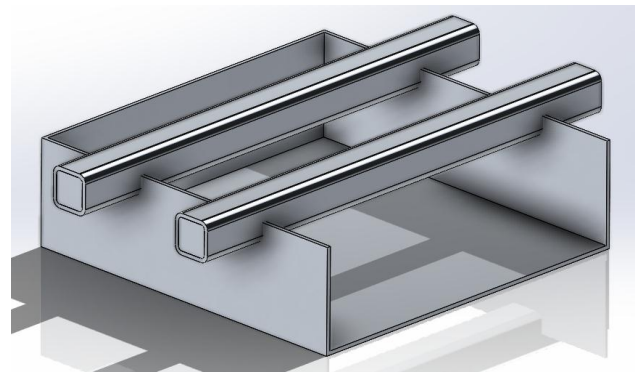


Fig 5. Collector

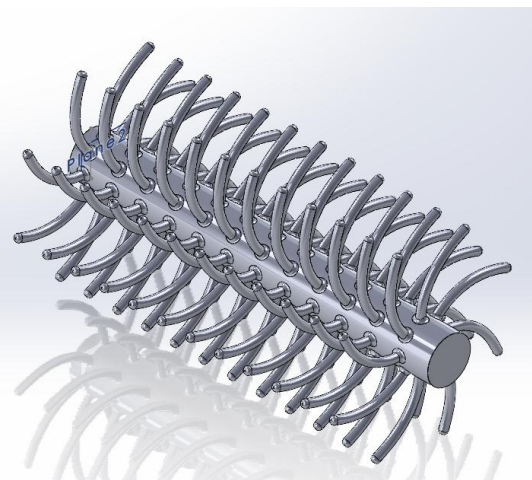


Fig 3. room Model

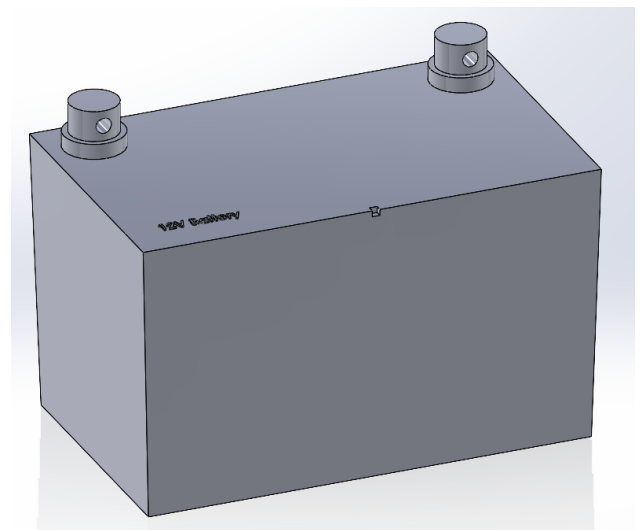


Fig 6. Battery

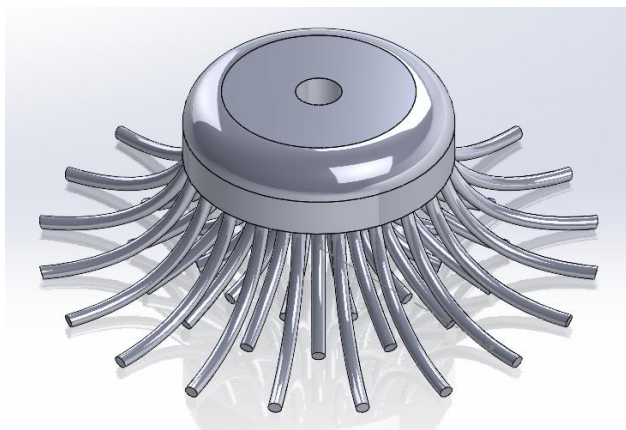


Fig 4. Scrubber Model

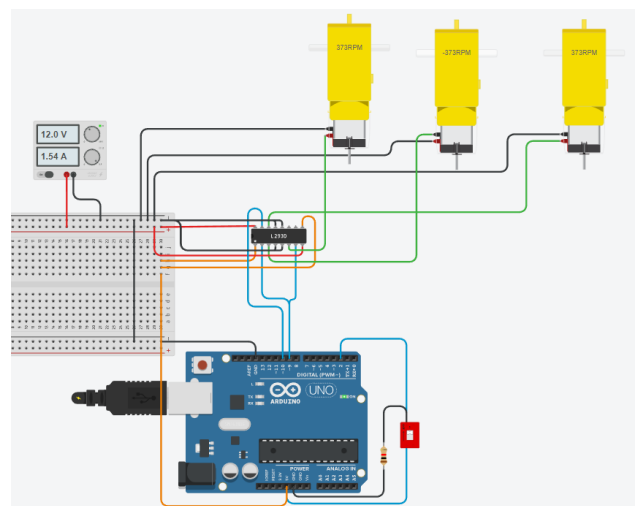


Fig 7. Circuit used for controlling the motors

3.2 Components

1. Pillow Block Ball Bearings:

These consist of an insert bearing mounted in a housing, which can be bolted to a support surface. The bearings are being used for the wheels.

2. SK Series Linear Shaft Support:

Linear shaft support is partly used to hold a linear shaft and is being used to hold the rotating broom in place.

3. Broom:

The broom is connected behind the scrubbers and is being used for sweeping the dust in the garbage container. The shaft is being rotated with the help of a DC gear motor.

4. Scrubber:

There are two scrubbers being used in the machine which are located between front wheels. These wheels are also rotated with the use of two DC gear motors.

5. Chassis:

The chassis is made from aluminum to make the machine light and corrosion resistant and has dimensions of 80cm x 60cm.

6. Orange OG555 High Torque DC Motor 12V 100RPM 173.6N-cm Encoder Compatible:

The DC motor provides us with a torque of 173.6 N-cm and a gear reduction of 90K. The shaft length and diameter are 27mm and 6mm respectively. The motor is also lightweight and compact, with high performance. The shaft in the motor is a D-type shaft and it makes the wheel or coupling arrangement simple.

7. Node MCU (ESP 8266):

Node MCU is an open-source software and hardware environment built around the inexpensive system-on-a-chip called the ESP 8266. The Node MCU consists of overall 30 pins and can take an input of 5V and can give an output of 3.3V via the 16 GPIO (General Purpose Input Output) pins.

8. Motor Driving Circuit:

The L298N motor driver is based on a H-bridge configuration used to control the direction of DC motors. The driver provides flexibility in usage of motors as it can be used to brake the motors instantly or let it freely coast to a halt. Circuit consisting of L298N motor driver IC 78M05 voltage regulator, and many more components in an integrated circuit and is used to control the motors connected to the brushes. It takes a voltage input of 1.5V and can control 2

motors at a time. The driver can provide up to 46V and 4A of output, 2A per channel. It also has overtemperature protection and has a high noise immunity.

9. Battery:

A battery with an output of 12V and a capacity of 35Ah to provide a sufficient life for the machine.

4. DISCUSSIONS

The project was divided into two major parts i.e., mechanical and electronics. The mechanical part consists of building a base of the bot and preparing a cad model of it. The part that comes under the electronics domain is about controlling the motors. The solid works model and the electronics both are the outcomes of marathon discussions between group members. All the discussions between group members were fruitful at the end for getting our desired goal accomplished in the given time limit.

5. LIMITATIONS

The major limitation of the machine is that it cannot clean stairs. While it might be able to clean the potholes, it has trouble cleaning it and has a possibility for them to get stuck in the pothole and is not suggested to be used for cleaning potholes. It is also semi-automated and cannot run without being under any supervision and might be heavy for a few people. The machines also must be emptied of the dust, garbage, etc. manually.

6. FUTURE SCOPE

The machine can have a good demand in the future if completely automated with the use of sensors and more advanced technology, which would also make it more efficient and get rid of the disadvantages while trying to keep the cost at a minimum. The design and fabrication method can also be improved to improve performance.

7. Conclusion

The machine would be useful in compact places like alleyways, small roads, and even footpaths. It would help people to clean the roads easily without any effort, and reduce the time required for this task to be done manually by humans using the conventional methods. It would also decrease the dust that is blown in the air and can enter the respiratory system while cleaning the road and can cause respiratory problems. With the increase in demand, we can see more and more people using it and the small and neglected roads and footpaths getting cleaned.

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